

REMARKS

Reconsideration of the application in view of the following remarks is requested. Claims 15, 19, and 38-50 are in this application. Claim 15 has been amended to add a limitation, delete a limitation, and to correct an inadvertent error. Claims 45-50 have been added.

The Examiner withdrew claims 40-44 under 37 CFR 1.142(b) as being drawn to a non-elected subcombination, there being no allowable generic or linking claim. Applicant respectfully does not understand the Examiner's grounds for withdrawing claims 40-44. Restriction is proper only when two or more inventions are claimed in a single patent application. Thus, the issue that must be determined is whether the present application claims more than one invention.

Applicant notes that claims 40-44 (and newly added claims 45-50) are dependent claims. A dependent claim depends from an independent claim, and includes all of the limitations of the independent claim. Since the dependent claim includes all of the limitations of the independent claim, it is not possible for the independent claim and the dependent claim to be directed to two different inventions.

Since it is not possible for two or more inventions to be present, claims 40-44 may not properly be restricted out from claim 15. Thus, applicant respectfully requests that claims 40-44 be reinstated. In addition, since it is not possible for two or more inventions to be present, claims 45-50 are also properly added.

The Examiner rejected claims 15, 19, and 38-39 under 35 U.S.C. §103(a) as being unpatentable over Gens et al. (U.S. Patent No. 5,515,225) in view of the Admitted Prior Art (APA). For the reasons set forth below, applicant respectfully traverses this rejection.

Amended claim 15 recites, in part,

“a plurality of pads;  
“an electrostatic discharge (ESD) negative ring;  
“a plurality of ESD positive lines, the plurality of positive lines not being electrically connected to each other, the plurality of positive lines not being connected to the pads;

“a plurality of ESD switches connected to the ESD positive lines and the ESD negative ring so that each positive line is connected to the negative ring via an ESD switch;

“a plurality of first diodes connected to the pads so that each first diode is connected to a pad and the negative ring;

“a plurality of second diodes connected to the pads so that each second diode is connected to a pad and a positive line.”

In rejecting the claims, the Examiner pointed to pads P1 and P2 shown in FIG. 2 of Gens as constituting the plurality of pads, and bus R2 shown in FIG. 2 of Gens as constituting the ESD negative ring. The Examiner also pointed to diodes D2 in FIG. 2 of Gens as constituting the plurality of first diodes, and diodes D1 in FIG. 2 of Gens as constituting the plurality of second diodes.

The Examiner further pointed to “the horizontal lines connected to the high power supply terminals (the square blocks indicated as VDD1 and VDD2) and the line connecting the two diodes” as constituting the plurality of ESD positive lines. Based on this description, applicant can not determine what structure the Examiner is reading to be the plurality of positive lines.

The Gens reference, however, fails to teach or suggest a plurality of second diodes as required by claim 15. As noted above, each second diode must be connected to a pad and a positive line. As shown in FIG. 2 of Gens, the leftmost-labeled diode D1 can not be read to be a second diode because, although the leftmost-labeled diode D1 is connected to pad P1 (read to be a pad of claim 15), the leftmost-labeled diode D1 is also connected to a vertical line segment that is connected to bus R1.

Although applicant can not determine what structure the Examiner is reading to be the plurality of positive lines, there is no structure in Gens which can be read to be the plurality of positive lines. The vertical line segments connected to the cathodes of diodes D1 can not be read to be the positive lines because the vertical line segments are all connected to bus R1, thereby failing the requirement of claim 15 that the positive lines not be electrically connected together. Thus, since the vertical line segments connected to the cathodes of the diodes D1 are electrically connected together via bus R1, the vertical line segments can not be read to be the plurality of positive lines.

In addition, bus R1 can not be read to be a plurality of positive lines. This is because Gens only teaches a single bus R1, which is connected to the cathodes of device Z and diodes D1. (See column 3, lines 39-43 of Gens.) In addition, although bus R1 is shown in FIG. 2 as broken by squiggles and dashed lines, this is a well-known representation of a single line. Further, the cathodes of diodes D1 that are connected to pads P1 and P2 are both connected to bus R1 and, therefore, also fail the requirement of claim 15 that the positive lines not be electrically connected together.

The horizontal lines that are connected to the high power supply terminals (the square blocks indicated as VDD1 and VDD2) can not be read to be the positive lines because the plurality of positive lines must not be connected to the pads. As taught by Gens, the high power supply terminals VDD1 and VDD2 are pads. (See column 3, lines 44-45 of Gens.) Thus, since the horizontal line connected to VDD1 is connected to a pad, the horizontal lines that are connected to the high power supply terminals (the square blocks indicated as VDD1 and VDD2) can not be read to be the positive lines.

In addition to failing to teach or suggest a plurality of second diodes as required by claim 15, the Gens reference also fails to teach or suggest a plurality of switches as required by claim 15. The Examiner appears to agree, noting that Gens does not explicitly state that a plurality of switches are connected between the ESD positive lines and the ESD negative ring.

The Examiner argued, however, that it is well known in the art that diodes are switches. The Examiner then concluded that Gens teaches a plurality of switches such that each positive line is connected to the ESD negative ring via a switch. Based on this description, applicant can not determine what structure the Examiner is reading to be the plurality of switches.

Although applicant can not determine what structure the Examiner is reading to be the plurality of switches, there is no structure in Gens which can be read to be the plurality of switches. The diodes D2 (which the Examiner has already read to be the first diodes) can not be read to be the switches of claim 15. This is because, regardless of whether a diode can be utilized as a switch, one skilled in the art would not consider a diode that does not function as a switch to be a switch. For example, the middle lower diode D2 does not operate or function as a switch, and thus would not be considered to be a switch.

The ESD circuit shown in FIG. 2 of Gens functions to provide a low resistance current path from one pad to another pad when a large voltage differential is formed across the two pads, such as when being handled by an ungrounded person. For example, if a large voltage differential is formed between the VDD1 pad and the P1 pad, the diode D1 connected to the VDD1 pad forward biases, the zener diode Z (which functions as a switch) breaks down, and the diode D2 connected to pad P1 forward biases. As a result, an ESD current flows from the VDD1 pad through the diode D1 connected to the VDD1 pad, through the zener diode Z, through the diode D2 connected to pad P1, to pad P1.

On the other hand, if a large voltage differential is formed between the P1 pad and the VDD1 pad, the diode D1 connected to the pad P1 forward biases, the zener diode Z (which functions as a switch) breaks down, and the diode D2 connected to the VDD1 pad forward biases. As a result, an ESD current flows from the pad P1 through the diode D1 connected to the pad P1, through the zener diode Z, through the diode D2 connected to the VDD1 pad, to the VDD1 pad.

Thus, in neither case does the diode D2 that is connected to the VDD1 pad operate or function as a switch. Since the lower middle diode D2 does not operate or function as a switch, one skilled in the art would not read the diode D2 connected to the VDD1 pad in FIG. 2 of Gens to be a switch. Thus, the invention recited by claim 15 is not obvious in view of Gen's structure.

In the alternative, the Examiner argued that applicant's admitted prior art teaches a plurality of ESD switches including a transistor (figure 2) connected to the positive line and to the negative ring, respectively (page 2, lines 24-27). The Examiner then argued that it would be obvious to one skilled in the art to connect a plurality of ESD switches between the positive line and the negative ring in Gen's device to provide a more effective unidirectional flow of current during ESD operation. Applicant is unclear as to whether the Examiner is arguing that it would be obvious to replace the diodes D2 with switches, or obvious to use a switch with each diode D2.

The Examiner has not explained, and applicant does not understand, how replacing the diodes D2 that are connected to the pads with diodes that function as a switch would provide a more effective unidirectional flow of current. Applicant can find nothing in applicant's admitted prior art that teaches or suggests replacing diodes D1-D4 shown in

applicant's FIGs. 1A and 1B with zener diodes to provide a more effective unidirectional current flow. As a result, one skilled in the art would not be motivated to replace the diodes D2 that are connected to the pads with diodes that function as switches to obtain a more effective unidirectional current flow.

Alternately, the Examiner has also not explained, and applicant does not understand, how using a switch with each diode D2 would provide a more effective unidirectional flow of current. One skilled in the art would understand that the diodes D2 are sized to handle the maximum amount of current that the circuit is designed to handle. Given this, one skilled in the art would not be motivated to use a switch with each diode because the switch would provide no benefit and would consume valuable silicon real estate.

As a result, one skilled in the art would not be motivated to replace the diodes D2 that are connected to the pads with diodes that function as switches, or add a switch to the diodes D2 that are connected to the pads in view of applicant's admitted prior art.

Applicant notes that the Gens reference does teach the use of a switch, clipping device Z. However, at column 3, lines 59-63, Gens teaches that:

“[a]n advantage of the protection circuit according to the invention is that it includes a **single** clipping device Z disregarding the number of power supplies of the circuit. This provides a decrease in the surface area of the integrated circuit.” [Emphasis added.]

Thus, Gens teaches that one of the advantages of Gens is that only a single clipping device is required. Since Gens cites the use of a single switch to be an advantage, one skilled in the art would not be motivated to use multiple switches in the circuit shown FIG. 2 of Gens.

Thus, since Gens reference fails to teach or suggest a plurality of second diodes and a plurality of switches as required by claim 15, claims 15, 19, and 38-50 are patentable over Gens in view of applicant's admitted prior art.

Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are respectively requested.

Respectfully submitted,

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Dated: 1-16-02

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APPENDIX

In the Claims

Please amend claim 15 as follows:

15. (Third Amendment) A semiconductor chip having a substrate of a first conductivity type, the chip comprising:

a plurality of pads;

an electrostatic discharge (ESD) negative ring;

a plurality of ESD positive lines, [the plurality of positive lines not being connected to a steady voltage source,] the plurality of positive lines not being electrically connected to each other, the plurality of positive lines not being connected to the pads;

a plurality of ESD switches connected to the ESD positive lines and the ESD negative ring so that each positive line is connected to the negative ring via an ESD switch;

a plurality of first diodes connected to the pads so that each first diode is connected to a pad and [a negative line] the negative ring;

a plurality of second diodes connected to the pads so that each second diode is connected to a pad and a positive line.

New claims 45-50 have been added.